

A NEW CLASS OF AMINE COINITIATORS IN PHOTINITIATED POLYMERIZATIONS

BACKGROUND

[0001] In light cured applications utilizing Type II photoinitiators (hydrogen abstraction), low molecular weight amines are typically incorporated as a coinitiator. These small molecule amines are not always fully reacted and can remain in the final cured matrix, which pose complications such as residual extractables and leachables.

[0002] Using light to cure coatings comes with motivations such as environmental compliance, fast cure, improved physical properties and lower applied cost. These motivators translate into benefits of reduced solvent emissions, increased product speed/productivity, product performance, efficiency and cost effectiveness. The use of UV-EB has enjoyed a growth rate of approximately 10% per annum over the last decade and equates to an annual industrial usage of about 100,000,000 lbs. Nevertheless, some obstacles include cost of products, equipment cost, poor weatherability, adhesion and curing of thick samples and residual uncured materials. While many of these issues are successfully being addressed, unsolved problems and deterrents still exist.

[0003] A UV curable formulation can contain several fundamental components, of which can be monomers, functionalized oligomers, and photoinitiators (free-radical or cationic). Among additional components which can also be included are, for example, pigments, dyes, light stabilizers, radical scavengers and adhesion promoters.

[0004] Free-radical photoinitiators are typed into two classes: Type I, those that undergo photocleavage to yield free-radicals and Type II, those that produce initiating radicals through an abstraction process. Type I photoinitiators produce radicals through a unimolecular fragmentation. Examples of these include aromatic carbonyl compounds, such as derivatives of benzoin, benzilketal and acetophenone. One example is 2,2-dimethoxy-2-phenylacetophenone (DMPA), the reaction pathways of which are as follows: